Studying the Sky/Planets Can Drown You in Images:
Machine Learning Solutions at JPL/Caltech

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Today's science instruments can collect huge amounts of image data,
making traditional human-based comprehensive analysis an infeasible
endeavor . Our long-term goal is to develop a domain-independent system
capable of small-scale object recognition in large image databases for
science analysis. We view this effort as a step towards a new generation
of analysis tools where users specify what to search for simply by
providing the system with training examples, and letting the system
automatically learn what to do. The system would then automatically
search all images and produce a catalog of objects of interest for
analysis purposes. Two applications at JPL will be covered. The first
targets automating the cataloging of sky objects in digitized sky survey
consisting of three terabytes of image data and containing on the order
of three billion sky objects. The Sky image ('cataloging and Analysis
Tool (SKICAT) developed at JPL achieves a sky object classification
accuracy of about 94%, allowing accurate scientific analysis and theory
verification/refutation. The learning algorithms played an integral and
enabling role by automating the classification and cataloging of
hundreds of millions of objects, the majority of which being too faint
for visual recognition by astronomers, and by recognizing objects that
are at least one isophotal magnitude fainter than any objects cataloged
in large-scale photographic surveys to date. The second part of the
talk will cover JARtool (JPL Adaptive Recognition Tool) targeting the
detection and cataloging of over an estimated 1 million small volcanoes
visible in the Magellan SAR database of over 30,000 images of Venus.
The techniques described are applicable to a wide range of domains since
the problem of visual pattern recognition appears in many domains,
including medical and biological imaging, industrial. product inspection, and
surveillance, as well as astronomy, and planetary science.

NOTES :
    SKICAT work is in collaboration with N. Weir and S. Djorgovski of the
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    JARtool work is in collaboration with Padhraic Smyth of JPL,
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